Frame for holding sheet material taut

The invention relates to a frame for holding sheet material taut.

Such a frame can be used, for example, in the electrolytic treatment of the surface of metal sheets. For this purpose the frame with the taut sheet is placed in a bath containing an electrolytic liquid. The pre-treatment of aluminium sheets that are processed to give laminated skin panels for the aviation and aerospace industry may be mentioned by way of example. Such aluminium sheets are anodised in a chromic acid bath.

Usually the sheets are fairly thin, between 0.3 mm and 0.4 mm, as a result of which they are fairly vulnerable to damage such as creases, scratches and the like. For this reason as well the use of a frame is necessary.

The frame with the sheet is placed vertically in the bath. To prevent the relatively thin sheet sagging during this operation it must be held taut in the frame. The tensile pretension resulting from pretensioning must be maintained throughout the entire electrolysis process. However, this cannot always be guaranteed, especially in the case of relatively large sheets. As a consequence of the electrolysis there is a rise in temperature, as a result of which the sheet expands. The tensile pretension decreases as a result and can even be completely lost. The sheet will consequently start to sag, which can lead to damage and creasing.

The aim of the invention is to provide a frame with which this problem does not arise. According to a first aspect of the invention this aim is achieved in a frame for holding sheet material taut, comprising a support as well as two legs which extend essentially parallel to one another transversely from the support, on which legs fixing means are provided for fixing, each one of the opposing edges of a piece of sheet material thereto, characterised in that at least one of the legs can be moved along the support towards and away from the other leg. According to a preferred embodiment compensation means are provided which interact with a movable leg to compensate for stretch and/or shrinkage of the piece of sheet material fixed between the legs.

When the taut sheet becomes warmer during the treatment the tensile pretension therein can nevertheless be maintained by the action of the compensation means. These can be constructed in various ways. Preferably, the compensation means comprise a spring member, one end of which is able to bear on a fixed point in the frame and the other end of which interacts with the movable leg. Other embodiments are, however, also possible, such

as, for example, with motorised means for holding taut that are controlled by a tension sensor.

The compensation means can comprise a securing member that can be secured in various positions along the support, the spring member extending between said securing member and the movable leg. The support can comprise an I-shaped or upside-down T-shaped beam, in which case the securing member comprises a movable clamp around the bottom flange of the support. Preferably, the clamp has a slider with respect to which the movable leg can be slid, which slider has a stop to limit the sliding movement of the leg with respect to the clamp.

According to a simple embodiment, the spring member has a helical spring as well as a guide extending through the helical spring, which guide is attached at one end to the clamp such that it can slide and at the opposing end is fixed to the leg. This guide can have a stop that interacts with the clamp, such that the helical spring is pretensioned between the clamp and the leg if the stop is in contact with the clamp.

The movable leg has a base provided with rollers that can be rolled relative to the beam. In the conventional manner, the legs have contact means for feeding an electric current through sheet metal material.

Finally, the invention relates to a device for carrying out an electrochemical treatment on sheet metal, comprising a container for a liquid bath as well as a frame as described above.

The invention will be further described with reference to an illustrative embodiment of a frame according to the invention shown in the figures.

Figure 1 shows the frame partially in side view.

Figure 2 shows the frame partially in plan view.

Figure 3 shows the frame partially in the exploded state.

The frame according to the invention comprises a support 1 constructed as an I beam, with respect to which the two legs 2, 3 extend laterally parallel to one another. The legs each have a triangular shape with a mutually parallel main member 4 that is braced by the strut 5 that is somewhat inclined.

The one leg 2 is fixed by means of a bolted joint 6 to the I-shaped beam 1. The other leg 5 is supported by means of a trolley 7, which has wheels 8, such that it can be moved along the support 1. The rollers 8 each bear on one of the flanges 9, 10 of the I-shaped support 1.

The beams 4 of the supports 2, 3 each have clamps 11, by means of which a sheet (not shown) can be clamped. The clamps 11 also have electrical contacts, such that a voltage can be applied to the taut sheet.

During the electrolytic treatment of the sheet concerned the latter becomes warmer, as a result of which expansion follows. However, it is important that the sheet remains taut under tensile pretension between the legs 2, 3 and for this purpose the compensation means indicated in their entirety by 12 are provided. These compensation means 12 comprise a clamp 13 that is fitted on the bottom flange 10 of the support 1. By means of a suitable screw connector 14 the clamp 13 can be secured in the desired position on the support 1 or can be released so that it can be moved.

A slider 15, which runs through a corresponding slot 16 in the trolley 7, is fixed to the clamp 13. At the end of the slider 15 remote from the clamp 13 there is a stop 17, such that the trolley is not able to run off the slider 15.

In addition, a pin-shaped guide 18 is fixed to the leg 3, which guide 18 protrudes through a corresponding hole in the downward pointing lip 19 of the clamp 13. The pin 18 is provided with a head 20 which has a larger cross-section than the hole in the lip 19 and thus is not able to move though the hole.

A pretensioned helical spring 22 extends between the lip 19 and the stop 21 on the leg 3.

After the sheet has been stretched taut between the legs 2, 3, the clamp 13 is moved such that the lip 19 is free of the head 20 and the spring 18 is pressed in. In this state the clamp 13 is locked with respect to the support 1 by means of the screw connector 14. Should the sheet become warm and stretch under the influence of the treatment process, the tensile force produced by the spring 18 can still be maintained in the sheet because the leg 3 is able to move somewhat under the influence of the spring pretension. The movement path must be sufficiently long that the head 20 does not make contact with the lip 19.

The following may be mentioned as examples of metals from which the sheet material can be made: Al, Ti, Sc, Cu, Mg and Li.